Washington State
Department of Transportation

AASHTO T 307 (Modified)

Determining the Resilient Modulus of Soils and Aggregate Materials

AASHTO T 307 has been adopted by WSDOT with the following changes and/or additions:

Section 3.3 and Section 3.4:

Any material that is cohesive enough that it can form a cylinder and remain intact through a Resilient Modulus test shall be considered Type 2 material. All other material shall be considered Type 1.

Section 3.8:

The Contact Load is 5.0 psi.

Section 6.1:

The LVDTs will be clamped to the center of the specimen.

Section 6.3.1:

The load cell will have a capacity of 1,000 pound-force, and an accuracy of ± 2.5 1,000 pound-force.

Section 6.3.3:

The LVDTs will be inside the test chamber.

Section 6.3.3.2 through Section 6.3.3:

Note 2 Following Section 6.3.1, Section 6.3.3.2, and Section 6.7:

The load cell will be calibrated by outside services and the LVDTs will be verified by WSDOT Verification Procedure VP-68.

Section 6.4:

Specimens will be compacted by impact or vibration.

Section 6.6:

Remove bubble chamber, nor a membrane expander, and porous stones nor porous bronze discs from list of equipment.

Section 7.1.1:

Use 4-inch diameter specimens for all types of materials. Particles retained on the 19 mm sieve will be scalped. The sample gradation will be per Appendix C of the WSDOT Lab. Manual.**

Section 7.3 Replace in its entirety with:

The target moisture content of the sample is to be the amount of moisture, which will cause exudation from the sample at 300 psi.

The target density of cohesive material is that produced by impact compaction per the section on compaction.

The target density of granular materials is that produced by vibratory compaction per the section on vibratory compaction.

Section 7.4:

See comments under Section 6.4.

Section 7.4.3:

Samples will be prepared and used the same day.

8. Resilient Modulus Specimen Set Up For Subgrade, and Base Materials

Section 8.1.

WSDOT uses the Resilient Modulus test only for laboratory compacted samples. All samples will be approximately 4 inches in diameter.

Section 8.2.

Cohesive specimens are placed in the triaxial chamber and loading apparatus in the following steps:

Place a filter paper on the base, place the specimen on top of the filter paper, and put the load cell on top of the specimen.

Section 8.3.

Granular specimens are compacted on the base of the triaxial chamber inside a rubber membrane, with a vacuum applied to the membrane.

When compaction is finished, the vacuum line will be moved to produce a vacuum inside the membrane. The membrane is checked for leaks.

If leaks are found they can usually be sealed for the duration of the test with masking tape or the equivalent. If leaks cannot be sealed, remove the specimen from the rubber membrane, and prepare a new specimen using another rubber membrane.

Once a specimen has been prepared in an airtight membrane, the O-ring sealing the membrane at the base is checked. The load cell is placed on top of the specimen, and the membrane is extended over the load cell. An O-ring or other seal is placed on the load cell.

Section 8.4.

For both cohesive and granular specimens, the LVDTs will be placed at about the middle of the specimen, and adjusted so that the LVDTs make good contact with the clamps.

Section 8.5.

Place the chamber on the base plate and the cover plate on the chamber. Insert the loading piston and obtain a firm connection with the load cell. Tighten the chamber tie rods firmly.

Section 8.6.

Slide the assembly apparatus into position under the axial loading device. Position the piston rod precisely under the loading device. Apply a small (1 to 3 psi) contact stress to the test specimen then put the triaxial chamber under pressure.

Check that there are no air leaks. If air leaks from the edges of the chamber, the chamber must be disassembled, the edges cleaned, and possibly moistened. Repeat until chamber is airtight. (A very small amount of air leak around the piston road is acceptable.)

Section 8.7.

Connect the air pressure supply line to the triaxial chamber and apply the pre-conditioning confining pressure of 4 psi to the test specimen. Raise the contact stress to 5 psi.

9. Resilient Modulus Test Procedure- For Subgrade, and Base Materials

Section 8.8.

Begin the test by sample conditioning with a minimum of 1,000 repetitions of a load equivalent to a cyclic Stress of 8 psi.

If the total vertical permanent strain exceeds 5 percent during conditioning, stop the test and report the result on the appropriate worksheet. Recreate the sample, using extra care to assure adequate compaction. If the sample again reaches 5 percent total vertical strain during conditioning terminate the test and report on the worksheet.

Apply 200 load applications between each item on the testing sequence. Record the average recovered deformations for each LVDT separately for one cycle on the report form.

Modified table 5 and 6 are used for the conditioning and testing sequences. **

If at any time the total vertical permanent strain exceeds 5 percent, stop the test and report the result on the appropriate worksheet.

10. Calculations

Use the WSDOT computer generated stress-strain curve for the specimen.

11 Report

Fill out the RESILIENT MODULUS WORKSHEET, and the SOILS Software Worksheet.

The report will be generated by the SOILS Software.

Appendix A SAMPLE PREPARATION

Section A.1.2.2. and A.1.2.2.3.

Omit

Section A.1.1.2.7

Cure sample only if necessary according the judgment of the operator.

Appendix B VIBRATORY COMPACTION

Section B.2.3:

The compactor head diameter is approximately 50mm.

Section B.3.2.

Omit

Section B.3.8. through Section B.3.10

Omit

Section B.3.14.

Insert the vibrator and vibrate the soil, being careful that the only pressure applied is from the weight of the vibrator. Vibrate for approximately one minute, moving vibrator head to different parts of the layer.

Appendix C COMPACTION OF TYPE 2 SOILS

Type 2 soils are compacted as for T-99, except that the specimen shall be compacted in eight lifts to a height of eight inches.